IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : William L. Bowden et al. Art Unit : 1745
Serial No. : 10/085,303 Examiner : Raymond Alejandro
Filed : February 28, 2002
Title : NON-AQUEOUS ELECTROCHEMICAL CELL

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Alexandria, VA 22313-1450

BRIEF ON APPEAL

Appellants are appealing the final rejections of claims 1-7 in the final Office Action mailed on August 4, 2005. Appellants request that the rejections be reversed. A Notice of Appeal was filed on November 2, 2005.

CERTIFICATE OF MAILING BY FIRST CLASS MAIL

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February 2, 2006
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(1) Real Party in Interest

The real party in interest is The Gillette Company, Prudential Tower Building, Boston, Massachusetts 02199-8004. The Gillette Company was acquired by the Procter & Gamble Company in the fourth quarter of 2005.

(2) Related Appeals and Interferences

There are no known related appeals or interferences.

(3) Status of Claims

Claims 1-7 are pending and stand rejected under 35 U.S.C. § 103(a) over U.S. Patent Publication No. 2003/0186110 to Sloop ("Sloop"), or U.S. Patent No. 5,554,462 to Flandrois et al. ("Flandrois"), each in view of either U.S. Patent Publication No. 2001/0028871 to Harrison et al. ("Harrison") or U.S. Patent Publication No. 2004/0005267 to Boryta et al. ("Boryta").

Claims 8-17 were canceled previously.

(4) Status of Amendments

All amendments have been entered.

(5) Summary of Claimed Subject Matter

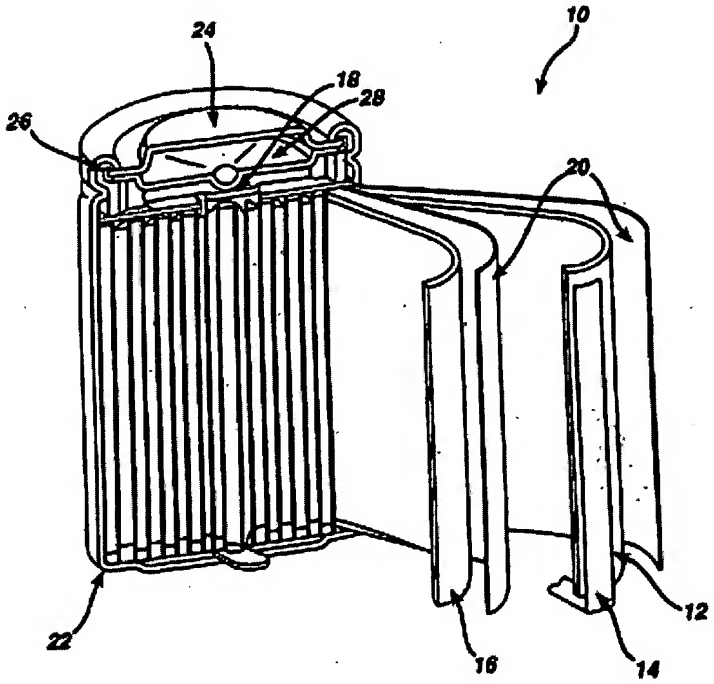
The claimed invention relates to a lithium battery (cell) that includes only a minute (less than 1500 ppm) quantity of sodium. The cell includes a specific combination of solvents and a specific combination of lithium salts. Claim 1 is representative of the claims on appeal:

> 1. A lithium electrochemical cell, comprising:
> an electrolyte comprising:
> a mixture of solvents comprising:
> propylene carbonate;
> dimethoxyethane; and
> a salt mixture comprising:
> lithium trifluoromethanesulfonate; and
> lithium trifluoromethanesulfonimide,
> wherein the cell contains from about 100 to 1500 ppm by weight of sodium.

The focus of the argument in this appeal will be the limitation "the cell contains from about 100 to 1500 ppm by weight of sodium." Appellants explained in the specification that the sodium content of the cell included the sodium inside the cell plus any sodium on the walls of the container. For the convenience of the Board, the relevant discussion from the specification, and the Figure illustrating the cell discussed, are provided below (see page 5, ¶ 23):

> The sodium concentration described herein applies to contents inside cell 10 plus any sodium on the inner side of case 20 and/or cap 24. For example, the sodium content may apply to the electrolyte and a "jelly roll" inside cell 10. The jelly roll is formed of anode 12, cathode 16, current collectors 14 and 18, separator 20, and any protective tapes used in cell 10.

FIG. 1



Appellants believe that they are the first to recognize that reducing the overall quantity of sodium in the lithium cell enhances the ability of the cell to retain a good capacity during storage for extended periods of time. See page 3, ¶ 15. Appellants explained that in order to obtain a lithium cell having a sodium content of less than 1500 ppm, a special controlled process must be used to manufacture the cell (see page 5, ¶ 24):

> Generally, the concentration of sodium in cell 10 can be controlled, e.g., minimized or reduced, by controlling the manufacturing of the cell. For example, in embodiments in which electrolytic manganese dioxide (EMD) is used in cathode 16, the EMD can be washed and/or neutralized after electrodeposition with an agent that does not contain sodium or have reduced amounts of sodium, such as LiOH. Case 20 can be cleaned with a solution that does not contain sodium or carefully washed. Generally, other components of cell 10, such as anode 12 and separator 20, can be similarly specified not to contain sodium or to contain reduced amounts of sodium.

A Declaration Under 37 C.F.R. § 1.132 of Michael Pozin[1] ("Pozin Declaration") explains the significance of the special controlled process in obtaining a lithium cell with less than 1500 ppm sodium:

> 5. Unless the lithium electrochemical cell is manufactured using a controlled process or a process disclosed in the above-identified application, the lithium electrochemical cell typically would have a sodium content greater than 1500 ppm.
>
> 6. Components of a lithium electrochemical cell can have varied sodium content. Accordingly, unless the components of a lithium electrochemical cell are specifically obtained or expressly specified to have a low sodium content, the sodium content of the lithium electrochemical cell components typically would result in a cell having a sodium content of greater than 1500 ppm.

[1]The Pozin Declaration was filed with the Amendment filed on November 29, 2004. A copy of the Declaration is enclosed as Exhibit A.

(6) Grounds of Rejection

For purposes of this appeal, all claims stand or fall with claim 1.

Appellants request reversal of the 35 U.S.C. § 103(a) rejection based on the combination of Sloop and Harrison.

Appellants request reversal of the 35 U.S.C. § 103(a) rejection based on the combination of Sloop and Boryta.

Appellants request reversal of the 35 U.S.C. § 103(a) rejection based on the combination of Flandrois and Harrison.

Appellants request reversal of the 35 U.S.C. § 103(a) rejection based on the combination of Flandrois and Boryta.

(7) Argument

None of the references relied on by the Examiner suggests reducing the sodium content of a lithium cell to less than 1500 ppm to improve the capacity retention of the cell during long-term storage, or for any reason. More generally, none of the references even suggests that special care should be taken when manufacturing a lithium cell to keep the overall sodium content of the cell as low as possible.

Appellants initially will discuss the applicable legal standards and then will discuss the 35 U.S.C. § 103(a) rejections and explain why they should be reversed.

35 U.S.C. § 103(a) provides in relevant part:

> (a) A patent may not be obtained... if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

In order to find a claim obvious under 35 U.S.C. § 103(a), there must be a suggestion in the prior art to combine or modify the prior art to obtain the subject matter covered by the claim. See, for example, in In re Oetiker, 977 F.2d 1443, 1447 (Fed. Cir. 1992), in which the Court stated:

> There must be some reason, suggestion, or motivation found in the prior art whereby a person of ordinary skill in the field of the invention would make the combination.

The Federal Circuit has cautioned repeatedly that the suggestion or motivation required for obviousness cannot derive from a hindsight reconstruction of the claimed invention that uses the claim as a roadmap for establishing obviousness. For example, in In re Fritch, 972 F.2d 1260, 1266 (Fed. Cir. 1992), the Court cautioned:

> [I]t is impermissible to use the claimed invention as an instruction manual or 'template' to piece together the teachings of the prior art so that the claimed invention is rendered obvious....

Similarly, in W.L. Gore and Associates v. Garlock, Inc., 721 F.2d 1540, 1553 (Fed. Cir. 1983) the Court explained:

> To imbue one of ordinary skill in the art with knowledge of the invention when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher.

(a) The 35 U.S.C. § 103(a) Rejection Based on Sloop and Harrison Should Be Reversed

Claims 1-7 were rejected under 35 U.S.C. § 103(a) in view of the combination of Sloop and Harrison. Appellants request that this rejection be reversed.

Sloop describes a method for removing the electrolyte from a lithium cell using a supercritical fluid. Thus, Sloop relates to destroying lithium cells, not to manufacturing lithium cells, or to specific attributes of lithium cells. In fact, Sloop does not describe any procedures for making lithium cells, and does not even disclose a specific cell. Sloop does mention that a lithium cell may include the solvents and lithium salts required by claim 1.

Harrison describes a process for purifying lithium carbonate. The purified lithium carbonate can be used to make lithium chloride which subsequently can be converted to ultrapure lithium metal. See Harrison, ¶¶ 29-30. The ultrapure lithium metal includes very small quantities of impurities such as sodium (less than 100 ppm), magnesium, ion, potassium, and chloride. See id. ¶ 30.

The ultrapure lithium metal produced by Harrison can be used as an active electrode component in lithium cells including polymer solvents. See id. ¶ 5. It is, of course, desirable to use pure lithium metal in lithium cells because any impurities in the lithium metal decreases the quantity of lithium in the electrode that can be consumed when the cells are used. Thus, sodium or other impurities in lithium metal used as the active electrode material reduces the life of the cell because there is less active electrode material in the electrode. But Harrison does not suggest paying special attention to the overall sodium content of a lithium cell, which includes not only the electrode including lithium as the active metal but also, for example, the electrolyte, the container, the current collectors, the separators, and any tape and other components. The fact that ultrapure lithium is desirable for use in order to maximize the amount of active lithium metal in an electrode does not suggest that sodium concentration of the lithium cell as a whole should be less than 1500 ppm in order to minimize capacity loss during storage, or for any other reason.

Thus, neither Sloop nor Harrison, alone or in combination, suggests a lithium cell having an overall sodium content of less than 1500 ppm. Moreover, neither describes or suggests using a special controlled process (like the one described in Appellants' specification) for making a

lithium cell that would result in a lithium cell with a sodium content of under 1500 ppm; Sloop and Harrison do not even disclose a method of manufacturing a lithium cell.

Furthermore, even if the lithium metal from Harrison was used in an electrode of the general lithium cell described by Sloop, a lithium cell having a sodium concentration of less than 1500 ppm would not be obtained. Sloop does not teach using a controlled process to manufacture the lithium cell, which means the resulting cell would have a sodium concentration in excess of 1500 ppm even if the cell used pure lithium in the electrode. See Pozin Declaration, ¶¶ 3-6.

Therefore, the 35 U.S.C. § 103(a) rejection based on Sloop and Harrison should be reversed.

(b) The 35 U.S.C. § 103(a) Rejection Based on Sloop and Boryta Should Be Reversed

Claims 1-7 also were rejected under 35 U.S.C. § 103(a) in view of the combination of Sloop and Boryta. Appellants further request that this rejection be reversed.

Appellants already discussed Sloop. Boryta does not relate to lithium batteries but rather to a process for preparing lithium salts such as lithium carbonate and lithium chloride from brine. Boryta explains that the amount of sodium in the salts should be low in order to avoid explosions when the salts subsequently are used to make lithium (Boryata ¶ 4):

> It is desirable, from a commercial standpoint, to provide a source of lithium low in sodium content because sodium becomes reactive and potentially explosive in certain chemical processes, particularly those in production of lithium metal from lithium salts.

Boryta does not teach anything regarding the sodium content of lithium cells or the potential benefits that can be achieved in capacity retention during long-term storage by reducing the overall sodium content of lithium cells to less than 1500 ppm.

Thus, neither Sloop nor Boryta, alone or in combination, suggests a lithium cell having an overall sodium content of less than 1500 ppm. Moreover, neither suggests using a special controlled process for making a lithium cell that would result in a lithium cell with a sodium content under 1500 ppm; Sloop and Boryta do not even disclose a method for manufacturing a

lithium cell. Absent using such a controlled process, a lithium cell would have a sodium concentration in excess of 1500 ppm. See Pozin Declaration, ¶¶ 3-6.

Therefore, the 35 U.S.C. § 103(a) rejection based on Sloop and Boryta should be reversed.

(c) The 35 U.S.C. § 103(a) Rejection Based on Flandrois and Harrison Should Be Reversed

Claims 1-7 also were rejected under 35 U.S.C. § 103(a) in view of the combination of Flandrois and Harrison. Appellants further request that this rejection be reversed.

Flandrois describes a particular carbon anode for a lithium cell. Flandrois focuses on the carbon anode and how it is prepared, although he does describe a specific lithium cell including the combination of solvents and one of the lithium salts required by claim 1. See Flandrois, col. 6, lines 7-19. But Flandrois does not discuss or recognize the significance of keeping the sodium content of the cell low (sodium is not even mentioned). Moreover, Flandrois does not use any type of controlled process for preparing the cell that could lead to a low sodium content; the full discussion of making the cell is provided below (id. col. 6, lines 7-19):

> As shown in FIG. 6, a test cell was made up in the form of a button type electrochemical cell 60 containing the previously prepared anode 61 and a counter electrode 62 constituted by a lithium disk having a diameter of 22 mm and weighing about 110 mg. The two electrodes were separated by a microporous polypropylene (PP) separator 63 and by an electrolyte reservoir 64 constituted by PP fibers. The electrolyte used was composed of an organic solvent in the form of an equal volume mixture of ethylene carbonate and of dimethyl carbonate (EC/DMC), with lithium trifluoromethane-sulfonimide (LiTFSI) dissolved therein to a concentration of 1 mole/liter. The assembly was placed in a can 65 and closed in sealed manner by a cap 66 with an intervening gasket 68.

Harrison was discussed previously. Neither Flandrois or Harrison, alone or in combination, suggests a lithium cell having an overall sodium content of less than 1500 ppm. Moreover, neither suggests using a special controlled process for making a lithium cell that would result in a lithium cell with a sodium content under 1500 ppm. Flandrois is focused on a carbon anode, and Harrison is focused on a process for making lithium metal for anodes.

Furthermore, even if the lithium metal from Harrison was used in an electrode of the lithium cell described by Flandrois. a cell having a sodium concentration of less than 1500 ppm

would not be obtained. Flandrois does not teach using a controlled process to manufacture the lithium cell, which means the resulting cell would have a sodium concentration in excess of 1500 ppm even if the cell used pure lithium in the electrode. See Pozin Declaration, ¶¶ 3-6.

Therefore, the 35 U.S.C. § 103(a) rejection based on Flandrois and Harrison should be reversed.

(d) The 35 U.S.C. § 103(a) Rejection Based on Flandrois and Boryta Should Be Reversed

Claims 1-7 also were rejected under 35 U.S.C. § 103(a) in view of the combination of Flandrois and Boryta. Appellants further request that this rejection be reversed.

Flandrois and Boryta were discussed previously. Neither Flandrois or Boryta, alone or in combination, suggests a lithium cell having an overall sodium content of less than 1500 ppm. Moreover, neither suggests using a special process for making a lithium cell that would result in a cell with a sodium content under 1500 ppm. Flandrois is focused on a carbon anode, and Boryta is focused on processes for making lithium salts such as lithium carbonate and lithium chloride with low sodium to minimize explosions when the salts subsequently are used to make lithium. Neither suggests implementing special controlled processes for manufacturing the lithium cell disclosed by Flandrois. Absent using such a controlled process, a lithium cell would have a sodium concentration in excess of 1500 ppm. See Pozin Declaration, ¶¶ 3-6.

Therefore, the 35 U.S.C. § 103(a) rejection based on Flandrois and Boryta should be reversed.

(7) Conclusion

Appellants respectfully request that all the 35 U.S.C. § 103(a) rejections be reversed.

The brief fee of $500 is enclosed. Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

Date: February 2, 2006

Tu Nguyen, Tu Nguyen Reg. No. 42,934 for
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Appendix of Claims

1. A lithium electrochemical cell, comprising:

an electrolyte comprising:

a mixture of solvents comprising:

propylene carbonate;

dimethoxyethane; and

a salt mixture comprising:

lithium trifluoromethanesulfonate; and

lithium trifluoromethanesulfonimide,

wherein the cell contains from about 100 to 1500 ppm by weight of sodium.

2. The cell of claim 1, wherein the cell contains less than 1200 ppm by weight of sodium.

3. The cell of claim 1, wherein the cell contains less than 1000 ppm by weight of sodium.

4. The cell of claim 1, wherein the cell contains less than 800 ppm by weight of sodium.

5. The cell of claim 1, wherein the cell contains less than 600 ppm by weight of sodium.

6. A lithium electrochemical cell, comprising:

an electrolyte comprising:

a mixture of solvents comprising

40-80% by weight of dimethoxyethane; and

20-60% by weight of propylene carbonate; and

a salt mixture comprising:

lithium trifluoromethanesulfonate; and

lithium trifluoromethanesulfonimide, wherein the salt mixture has a concentration between 0.4 M and 1.2 M in the mixture of solvents, and

wherein the cell contains from about 100 to 1500 ppm by weight of sodium.

7. The cell of claim 6, wherein the mixture of solvents comprises:

50-75% by weight of dimethoxyethane; and

25-50% by weight of propylene carbonate.

Evidence Appendix

A copy of the Declaration Under 37 C.F.R. § 1.132 of Michael Pozin filed on November 29, 2004 is enclosed as Exhibit A.

Related Proceedings Appendix

None.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : William L. Bowden et al. Art Unit : 1745
Serial No. : 10/085,303 Examiner : Raymond Alejandro
Filed : February 28, 2002
Title : NON-AQUEOUS ELECTROCHEMICAL CELL

Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION UNDER 37 CFR § 1.132 OF MICHAEL POZIN

I, Michael Pozin, hearby declare as follows:

1. I am a named inventor in the above-identified patent application. I have a Ph.D. in electrochemical engineering from Saint Petersburg's University of Technology (Russia). I have been involved in the study of batteries for about 25 years. I have been employed at The Gillette Company (Duracell), the assignee of the above-identified patent application, for about five years.

2. I have read and understood the references cited in the Office action: U.S. Patent Publication No. 2002/0113622 to Blasi *et al.* ("Blasi"), U.S. Patent Publication No. 2003/0186110 to Sloop ("Sloop"), and U.S. Patent No. 5,554,462 to Flandrois *et al.* ("Flandrois").

3. None of the cited references disclose that the electrochemical cell was manufactured to have a controlled sodium content, nor do any of the cited references suggest that the electrochemical cells should be manufactured to have a controlled sodium content.

CERTIFICATE OF MAILING BY FIRST CLASS MAIL

I hereby certify under 37 CFR §1.8(a) that this correspondence is being deposited with the United States Postal Service as first class mail with sufficient postage on the date indicated below and is addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

11/29/04
Date of Deposit

Alissa Passacantilli
Signature

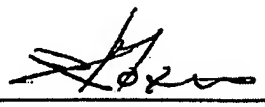
Alissa Passacantilli
Typed or Printed Name of Person Signing Certificate

4. Typically, cells of the general type described in the cited references will include sodium because sodium can be introduced during manufacture of the cells and/or from one or more components of the cells.

5. Unless the lithium electrochemical cell is manufactured using a controlled process or a process disclosed in the above-identified application, the lithium electrochemical cell typically would have a sodium content greater than 1500 ppm.

6. Components of a lithium electrochemical cell can have varied sodium content. Accordingly, unless the components of a lithium electrochemical cell are specifically obtained or expressly specified to have a low sodium content, the sodium content of the lithium electrochemical cell components typically would result in a cell having a sodium content of greater than 1500 ppm.

7. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that those statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.



Michael Pozin, Ph.D.

11.23.04

Date